National Park Service
Air Resources Division

Field Use of the Ogawa Passive Ozone Samplers 2000

Introduction

This document contains the information needed by the field operator for correct exposure of the passive ozone samplers during the 2000 monitoring season. Included is a description of the equipment, schedules, sample coding, and instructions for the deployment of the samplers. Results are posted on the web site at http://www2.nature.nps.gov/ard/gas/passives.htm

Background information

A low cost method for determining integrated ambient ozone exposures is being used this study. These devices, referred to as passive samplers, have no moving parts and do not require power to operate. The Ogawa samplers consist of a cylinder containing two nitrite-coated filter pads and a clip-on badge support. When these devices are exposed to ambient air, the ozone oxidizes the nitrite coating on the filters to nitrate. After exposure, the devices are returned to a lab where ion chromatography is used to determine the amount of nitrate formed and hence the overall ozone exposure. Exposure periods of one week are being used in the present study.

Schedule

The lab Contractor will purchase passive sampler filters from Ogawa USA, Inc. and load the sampler holders. The Contractor will then package and label the samplers prior to shipment to the park contact person. Park personnel will unpack and deploy the samplers according to the schedule given blow. A form will be included with each sampler to record exposure times, sample labels, events, and locations. After exposure of each of the weekly samplers for the month, the park personnel place the passive samplers in their shipping containers and return the samplers to the Contractor. The samples will be analyzed using ion chromatography at the Contractor's lab and results reported to the NPS Air Resources Division (ARD) data processing center.

Typically, loaded passive samplers are shipped by the Contractor the week before the beginning of the month of the scheduled sampler exposure. After exposure of the samplers, they are returned by the site operators at the end of the month to the Contractor using the pre-paid shipping forms and original shipping materials.

Ozone sampling will be continued for the whole of the "ozone season" defined as May through September except for the spatial distribution studies or the vegetation injury studies where other specific periods have been chosen,

Shipping Dates for Samples

The sampling season will be from the third week in May through the end of September, 2000. You will receive overnight shipments of samplers once a month with enough samplers for the full month. Each shipment contains 1 or 2 "blanks" which are samplers that are not exposure. They are along just for the ride. One or more duplicate samplers per sampling site are included that should be exposed during the first week of the month.

☞Return exposed samplers as soon as possible after the last one-week exposure of that month. It is very important that the lids to the plastic vials be taped shut. Changes in air pressure during shipment causes the lids to pop off otherwise.

Sampler Labels

Prior to shipment, each sampler is labeled according to the scheme below. Identical labels are attached to the Ogawa sampling device and to the storage vial. The colored plastic tape on the vials is used to seal the lids to the plastic vials to prevent them from coming off during shipment. **Please reuse the tape to seal the lids during return shipment**.

The samplers are labeled according to the codes below:

Coding scheme: (Park code - month/year - week # Dupl letter)
^ - ###2000 - ## A

Example: OLYM2 - May2000 - 01A to indicate Olympic site 2 in May, 1999, week 1, sample A

Color Code:

Blue tape - ozone sampler
Black tape - a "blank" - do NOT exposure

Table I

National Park Unit	Park Code	Month/year	Week # range
Badlands (2)	BADL	May-Sept/2000	01 - 05
Black Canyon of the Gunnison	BLCA	May-Sept/2000	01 - 05
Bryce Canyon	BRCA	May-Sept/2000	01 - 05
Capitol Reef	CARE	May-Sept/2000	01 - 05
Crater Lake	CRLA	May-Sept/2000	01 - 05
Flagstaff area park units (3)	FLAG	May-Sept/2000	01 - 05
Grand Teton	GRTE	May-Sept/2000	01 - 05
Isle Royale	ISRO	June-Sept/2000	01 - 05
Lake Mead NRA (3)	LAME	May-Sept/2000	01 - 05
Lava Beds	LABE	May-Sept/2000	01 - 05
Mount Rainier (8)	MORA	June- Sept/2000	01 - 05
New River Gorge	NERI	May-Sept/2000	01 - 05
Olympic (3)	OLYM	June- Sept/2000	01 - 05
Organ Pipe Cactus	ORPI	May-Sept/2000	01 - 05
Point Reyes	PORE	May-Sept/2000	01 - 05
Sequoia-Kings Canyon (2)	SEKI	June-Sept/2000	01 - 05
Wind Cave	WICA	May-Sept/2000	01 - 05
Yosemite (10)	YOSE	May-Sept/2000	01 - 05
Zion (3)	ZION	May-Sept/2000	01 - 05

Each blank sampler (samplers not exposed in the field, but analyzed for nitrate background) are labeled in a similar manner to the scheme above, but use the word "BLK" instead of the week. Also, each park will get at least one sampler duplicate per month. Duplicates are labeled as "A" and "B".

Example of coding for a blank: ZION - May2000 - blk #1
ZION - May2000 - blk #2

The number of blanks per park varies by month and should not be exposed. Just hold the blanks in an office or other location that is at comfortable room temperature. Each site will have a duplicate set of samplers for exposure during the first week of the month.

Materials required

In keeping with the low-cost of the samplers, the support equipment and operator time are minimized. The following items are required:

passive samplers (mounted on badges)
rainshield, made from PVC pipe
support tower, PVC pipe sections, clamps
nut driver and hammer *
sampler log forms
shipping materials, prepaid shipping labels

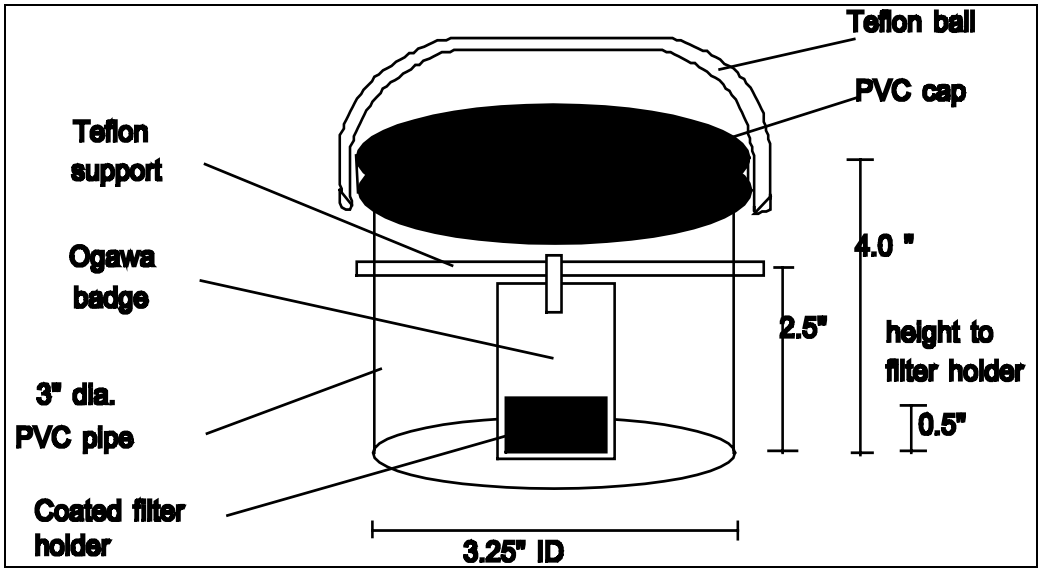
Everything on the list above is being provided by ARD except the tools.

Site equipment and handling

Design of the rain shields

We will use rainshields made from 3" diameter PVC plumbing pipe with a PVC upper-end cap. Attachment of the rain shield to the support tee's is accomplished by a bail made from 1/4" Teflon tubing that is held in place with a metal hose clamp. (In some cases the upper cap screws into the body of the rainshield. The clamp may have to be loosened to unscrew the cap.) Plastic tie-wraps are used to secure the bail to the support tees. A schematic diagram of the system is shown below:

Some locations that have suitable towers will receive only the upper "tee" section and a pair of metal "U" clamps to mount the tee-pole to the tower. To hide the sampling equipment, either green or sand color paint has been used. The operator may modify the poles or support system, as needed for local conditions. For example, use a metal stake or replace the pole with metal, fiberglass, or bamboo. The rainshield PVC section should not be modified without contacting John Ray at (303) 969-2820.



Note: For clarity, the metal band clamp and tie-wraps are not shown with the bail.

Figure 1. Diagram of the rainshield with the sampler badge correctly positioned.

The Ogawa badge is clipped to the 1/4" Teflon tubing inside the rain shield. The tubing inside is notched to provide a better surface to hold the clip. Be sure the tube part of the sampler badge is centered inside the rainshield and the aligator clip is all the way onto the tubing..

Samplers are to be mounted on PVC-pipe "tees" attached to PVC support poles. Diagrams to illustrate the mounting arrangements are shown below:

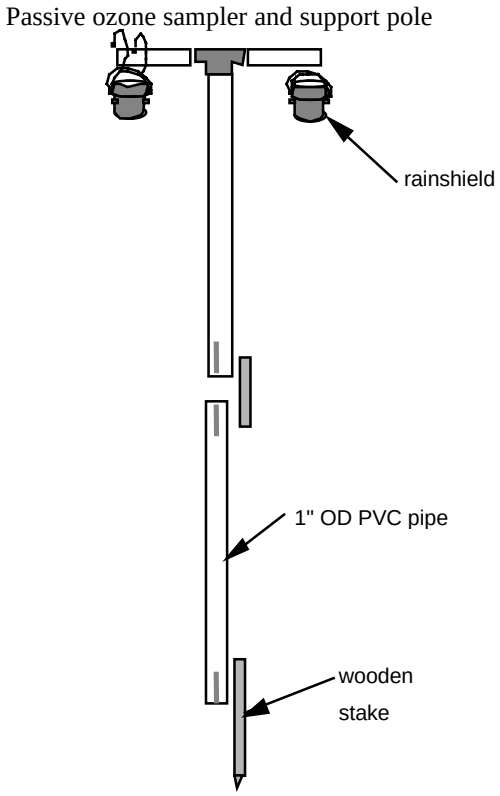


Figure 2. Diagram of the PVC sampling pole showing the parts and where the rainshields should be attached. Hose clamps are not shown. The poles were design to come apart at the center to make sampler changes easier.

Installation and Use of the PVC Support Poles

Materials

You should have received the following items:

1. (2) PVC rainshields as pictured in Figure 2
2. (2) 5-foot sections of 1.25" diameter PVC, painted gray/green, notched
3. (1) cross-arm consisting of (2) 3/4" diameter pipe sections + a PVC tee
4. (2) 1.16" diameter wooden dowels, one end has a sharp point
5. (3) metal hose clamps

The rainshields should be attached to the cross-arm with plastic tie-wraps and the wooden dowels should be clamped inside the PVC pipe sections for shipment.

Tools Required

screwdriver or nut driver
hammer
(optional) level or plumb

Installation of the sampling pole

1. Pick a location where the soil is not too rocky. An alternate to the wooden stake may have to be used otherwise.
2. Remove the sharpened wooden stake from the PVC pipe section where it is clamped. Use a hammer (or flat rock) to drive the stake at least 1-foot into the ground using care to get it true vertical. A level, plumb, or trial-and-error can be used to get the stake true vertical.
3. Assemble the top section by taking the cross-arm and fitting the tee onto the end of the 5-foot PVC pole section without an end-slot. If the cross-arm pipe sections with the attached rainshields are not both aligned in the tee, then align them so the rainshields will be vertical now.
4. Loosen the clamp on one end of the 5-foot PVC pipe section that has both ends slotted. Fit the pipe section onto the end of the wooden stake and then tighten the hose clamp with a nut driver or screwdriver.
5. Take the top pipe section, loosen the hose clamp, fit the pipe over the wooden dowel, and clamp the upper pipe section in place.
6. Now step back and examine the pole system. The pole should be nearly vertical, but may bend slightly. The rainshields should be aligned with the openings on the bottom pointed straight down. The pole bends and moves with the wind, but that's OK. Fix any problems you have spotted.

To change the samples

1. Loosen one of the clamps at the middle of the sampling pole and lift off the upper section. You can now reach the rainshields and samplers easily.
2. Remove the exposed samplers and replace with new samplers. Avoid touching the end caps of the barrel section of the sampling badge. Plastic gloves may be worn during the changeout.
3. Put the upper pole section onto the wooden dowel and tighten the hose clamp again.
4. Record the site location, sampler numbers, and date / times on the log sheet. Add comments. Done.

When to sample

Pick a day of the week (Tuesday is recommended, Wednesday is second choice) and a time when you can return to the sampling site every week. (For example, Tuesday mornings at about 10 am) Try to stick to that schedule or have a backup person that can help. Ideally the samples would be changed within the same hour and day of each week. Do that if you can, otherwise **the allowable range for changing the samplers is ± 1-day**. Sampling will continue a week at a time through September unless other arrangements have been made.

Instructions for exposing the passive samplers

The passive samplers should be stored at room temperature prior to deployment. Check the box of samplers when it is received to confirm that the correct number of coded samplers are there and that none of the lids have come off the yellow plastic vials. If a lid has come off or a sampler is damaged in any way, then record that sample as invalid and request a replacement sampler.

To start sampling

1. Record sample site, sampler code, date, time, comments, etc. on the log form prior to opening the yellow vial.

2. Open the yellow vial and remove the sampling badge from the resealable plastic bag. Save the tape by sticking it around the vial. Do NOT touch the ends of the barrel that is clipped into the badge.

3. Clip the badge to the Teflon tube inside a rainshield. Start with the badge upside down and then rotate the Teflon tube so that the barrel-end of the badge is down. (If the rainshield is the screw-on cap type, you must loosen the metal hose clamp and unscrew the PVC cap to position the sampler badge.)

4. Center the barrel-end of the badge within the rain shield by rotating or adjusting the position the Teflon support tube that the badge is clipped to. (This is easily done by holding the outside ends of the Teflon tubing and rotating the tube.) The barrel should be 1/2" up from the bottom of the rainshield. This allows for air circulation but prevents rain from impacting on the sampler.

5. Check that the badge and rainshield are secure and that the site, time, date, and sampler code have been recorded on the log sheets.

6. Blanks should be left in the yellow shipping vials. Store the blanks out of the sun in a location where the temperature will be roughly the same as that for the samples. Your office would be a good place.

5. Wait one week. Find something else to do. Don't worry.

To end sampling

1. Remove the badge from the rainshield, place it in the resealable plastic bag, and return the sampler to the yellow vial. Be sure the labels on the vial and the badge match. Tape the lid on the vial closed (very important!).

2. Record the site, time, and date on the log sheet. Confirm the sampler code and record the location of the site.

3. Record any comments including weather, unusual circumstances, or appearance of the sampler. (some real examples: a bear ate the sampler, sampler was on the ground, sampler was wet, "I was attacked by bees")

4. At the end of the month, return all the samplers, the blanks, and log sheets to the box they came in and tape the box closed. Attach the provided pre-addressed shipping label and return the box to the analysis contractor.

Sampler Report

Passive Ozone Sampler Program

2000

Park Code: _____ **Site name & number** _____ **Operator Name**: _____

Please fill out the sampler record and return with the exposed samplers at the end of the month. Thanks.

Week of the month	Date of start	Time of start	Date of stop	Time of stop	Sampler Code Number
	MMM/DD	HH : MM	MMM/DD	HH : MM	
1					
2					
3					
4					
5					

(Note: Use 24-hour clock and local standard time)

Please identify any of the following conditions or problems and explain below. Add notes on any unusual events (a bear broke the sampling pole; bees built a nest in the rainshield, etc.)

	Yes or No ? Explain
Shipping vial for samplers was open on arrival.	
Sampler/rain shield intact?	
Support tee in original position?	
Heavy rains w/strong winds during sampling period?	
Raining when sampler was changed?	
Sampler wet at any time?	

SAMPLING NOTES: _____

_____

_____

_____

2000STUDY SITEFORM.DOC
FORM NO. NPS/ARD-PSS-3

Obtaining Data and Reports

The lab analysis for each sample is reported by RTI and the ozone concentrations calculated and reported from an Access database maintained by Air Resource Specialists. Monthly data reports are posted to the web site at http://www2.nature.nps.gov/ard/gas/passives.htm **when the ozone data has been validated (about 60 days after the month of sampling). The annual summary is generally available by Janurary and it also posted on the web site. Several reports, publications, and samples of data analysis can also be found on the web site. On request, specific data summaries and comparisons can be prepared. Contact John Ray for further information.**

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